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Distribution, habitat shift, and conservation needs of Jerdon's Babbler *(Chrysomma altirostre)*: A study of a vulnerable grassland specialist

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Abstract Grassland ecosystems are vital for global biodiversity but are increasingly threatened by habitat loss, agricultural expansion, urbanization, and climate change. Jerdon's Babbler *(Chrysomma altirostre)*, a vulnerable grassland specialist, serves as a model species to assess the impacts of habitat degradation and fragmentation. This study analysed historical and current distributions, revealing a significant contraction from 326,263 km^2 to 173,071 km^2, representing a 47% reduction in the species' historical range. The overlap between historical and current ranges was limited to 71,623 km^2, while 101,448 km^2 of new areas were identified as potential habitat gain, indicating possible range shifts. The centroids of the distributions of the three subspecies shifted significantly: Indian and Saharo-Sindian subspecies moved northeast by 361 km and 444 km, respectively, while the Burmese subspecies shifted 490 km south. Populations in the Indo-Bangladesh region remain uncertain due to a lack of recent records. These findings underscore extensive habitat loss, reduced connectivity, and the persistence of fragmented populations primarily within protected areas. Conservation priorities include grassland restoration, habitat connectivity enhancement, and mitigating disturbances such as unauthorized playback and seasonal fires. While Jerdon's Babbler exhibits adaptability to degraded habitats, its long-term viability remains uncertain without targeted interventions. This study highlights the necessity of expanded conservation efforts to safeguard populations beyond protected zones and to preserve this species as an indicator of grassland ecosystem health.

Keywords: kernel density, temporal distribution, niche dynamics, climate change, grassland ecosystems

Összefoglalás A füves területek létfontosságúak a globális biológiai sokféleség szempontjából, de az élőhelyek elvesztése, a mezőgazdaság terjeszkedése, az urbanizáció és az éghajlatváltozás egyre inkább veszélyezteti őket. A Jerdon-timália *(Chrysomma altirostre)*, a füves területek sérülékeny specialista madárfaja szolgál modellként az élőhelyek pusztulásának és feldarabolódásának értékeléséhez. A szerzők tanulmányukban elemezték a faj történelmi és a jelenlegi elterjedését. A faj elterjedési területének kiterjedése 47%-os csökkenést mutatott, 326 263 km^2-ről 173 071 km^2-re esett vissza. A történelmi és a jelenlegi elterjedési terület közötti átfedés 71 623 km^2-re korlátozódott, míg 101 448 km^2-nyi potenciálisan új élőhelyen jelent meg a faj. Ez az elterjedési terület áthelyeződésére utalhat. Az alfajok elterjedésének központjai jelentősen, az indiai 361, a burmai 490, míg a szaharo-szindiai 444 km-rel eltolódtak. Az indo-bangladesi régió populációinak helyzete bizonytalan maradt, mivel nincsenek friss feljegyzések. Megállapításaik hangsúlyozzák az élőhelyek nagymértékű csökkenését és ezek elszigetelődését. Az elszigetelt populációk fennmaradása elsősorban a védett területeken belül lehetséges. A természetvédelmi prioritások közé tartozik a gyepterületek helyreállítása, az élőhelyek folytonosságának biztosítása, valamint az olyan zavaró tényezők mérséklése, mint az engedély nélküli hívóhang lejátszás és a szezonális tüzek. Bár a Jerdon-timália képes alkalmazkodni a leromlott élőhelyekhez, hosszú távú fennmaradása célzott beavatkozások nélkül bizonytalan marad. Ez a tanulmány rávilágít a védett területeken kívüli populációk megőrzését célzó, kiterjesztett védelmi erőfeszítések szükségességére.

Kulcsszavak: füves területek, időbeli elterjedés, kernel denzitás, klímaváltozás, niche dinamika

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Introduction

Grassland ecosystems are among the most threatened habitats globally, often overshadowed by conservation efforts prioritizing forests and wetlands (Siebert *et al.* 2024). These ecosystems play a vital role in biodiversity preservation, supporting a unique array of flora and fauna. However, they are increasingly at risk due to habitat conversion for agriculture (Banerjee *et al.* 2023, Douglas *et al.* 2023), urbanization, and climate change (Nandintsetseg *et al.* 2021). Jerdon's Babbler *(Chrysomma altirostre)*, a small passerine bird, is a grassland specialist whose survival is intricately linked to the availability of quality grassland ecosystems. As a grassland specialist, Jerdon's Babbler is particularly vulnerable to habitat degradation and fragmentation. As grassland habitats degrade, the species faces growing threats to its existence, making it as a significant conservation concern (BirdLife International 2020).

The bird, historically distributed across riverine grasslands in South and Southeast Asia, is currently classified as "Vulnerable" by the IUCN (BirdLife International 2020) and is increasingly affected by habitat fragmentation and human activities.

Biodiversity monitoring and the study of species distribution patterns are essential for understanding ecosystem dynamics and informing conservation strategies. For habitat-sensitive species such as the Jerdon's Babbler, these assessments are particularly crucial. Belonging to the family Paradoxornithidae, Jerdon's Babbler is native to subtropical and tropical grasslands and wetlands in the floodplains of South Asia. Its elusive behaviour, restricted distribution, and high sensitivity to habitat changes make it an important indicator of grassland ecosystem health. The species holds ecological significance as it occupies a unique niche within its habitat, relying on tall grasses dominated by species like kans grass *(Saccharum spontaneum)*, ravennagrass *(Tripidium ravennae)*, etiver *(Vetiveria zizanioides)*, tall reed *(Phragmites karka),* and Indian reed-grass *(Typha elephantina)*.

Three subspecies of Jerdon's Babbler are recognized (Cai *et al.* 2019), reflecting ecological variation and geographic separation. The nominate subspecies, *C. a. altirostre*, primarily inhabits the wetlands of Myanmar and adjacent regions (Harington 1913, Rheindt *et al.* 2014). The second subspecies, *C. a. scindicum*, is found in the drier grasslands of Pakistan (Ali & Ripley 1971) and Punjab, India (Sawant & Sudhagar 2013), while *C. a. griseigulare* is distributed across the wetter regions of the Himalayan foothills, including Bhutan and northeastern India (Sadanandan *et al.* 2018). These subspecies illustrate the species' adaptability to diverse grassland types, although they remain poorly studied and their ranges fragmented.

Jerdon's Babbler was first described in 1862 by Jerdon T. C. from the Ayeyarwady floodplain in Myanmar. Over time, historical records have documented its presence across the lowland floodplains of India, Nepal, Bangladesh, and Myanmar, where it was closely associated with grass-dominated ecosystems along rivers (Poudyal *et al.* 2020, Iqbal *et al.* 2023). However, inconsistencies in early records, including taxonomic discrepancies and limited field observations, have created ambiguities in understanding the exact historical range of the species. For instance, *C. a. scindicum* was variably referred to as "*scindicum*" or "*scindicus*" in earlier literature, while *C. a. griseigulare* was synonymized with *Pyctorhis altirostris griseigularis* (Baker 1923). The taxonomy of Jerdon's Babbler is marked by ambiguities due to historical classifications and overlapping morphological traits among its subspecies. The three recognized subspecies exhibit subtle plumage differences, with unclear distribution boundaries and potential intergradation zones. Discrepancies in type specimen descriptions and frequent synonymities (e.g. *Moupinia altirostris*, *Pyctorhis griseigularis*) further complicate taxonomy (Harington 1913, Deignan 1964). Morphological variability, possibly influenced by habitat, raises questions about the validity of current subspecies, while limited genetic studies and outdated distribution data hinder comprehensive conservation efforts. Resolving these issues requires integrative taxonomic approaches using genetic, ecological, and historical data.

Jerdon's Babbler is facing significant population declines across its range, with local extinctions reported in several regional pockets. In the Ayeyarwady-Sitaung plain, the species was believed to be locally extinct for over 73 years due to widespread agricultural expansion and the loss of wetland habitats. Remarkably, it was rediscovered after this long absence (Rheindt *et al.* 2014). Similarly, sightings across Pakistan and Myanmar became more sporadic (Poudyal *et al.* 2020), suggesting severe population declines driven by habitat fragmentation and degradation.

However, these grasslands are increasingly threatened by human activities. Agriculture, infrastructure development, and overgrazing have led to significant habitat loss, while invasive plant species and changes in flooding regimes further degrade habitat quality. Seasonal flooding, once a natural feature supporting grassland regeneration, now poses challenges due to climate change. Additionally, the potential construction of dams poses further risks by altering hydrological patterns, potentially undermining the ecological balance essential for the survival of these unique ecosystems (Sheth 2020).

The conservation of Jerdon's Babbler is further complicated by its fragmented distribution and the lack of large, continuous grassland patches. Even within protected areas like Kaziranga National Park and Manas National Park, habitat fragmentation due to seasonal flooding and fire events. Outside these protected zones, grassland patches in regions like Arunachal Pradesh remain vulnerable to unregulated human activities, including unsustainable agriculture and ecotourism (Dhyani 2024).

Another pressing issue is the unauthorized use of playback calls in ecotourism areas, particularly during breeding seasons. These practices disturb the species' natural behaviours, including mating and territorial displays, potentially affecting reproductive success (Harris & Haskell 2013). Combined with habitat degradation, such disturbances amplify the challenges of conserving Jerdon's Babbler.

This study aims to understand Jerdon's Babbler's distribution, and conservation needs by analysing historical records, mapping current distributions through field surveys and secondary data. The findings of this study are expected to contribute significantly to conservation planning for the species. Regular monitoring, habitat restoration, and public awareness are essential components of any successful conservation strategy, and this study aims to provide a scientific foundation for these efforts.

Methods

Study area

This study was conducted in Northeast India, focusing primarily on the Brahmaputra floodplains, particularly Assam and Arunachal Pradesh, where Jerdon's Babbler has been historically prevalent. The Brahmaputra River, one of South Asia's major rivers, flows through diverse landscapes across India, China, and Bangladesh, forming an extensive floodplain ecosystem that supports variety of grassland-dependent species. Secondary data were collected from various known population sites of Jerdon's Babbler across its range to complement field surveys, providing a broader perspective on the species' historical and current distribution.

Survey methodology

The study employed a two-pronged approach: field data collection and secondary data analysis. Field surveys were carried out in the Brahmaputra's islands and neighbouring grassland ecosystems within its drainage basin during two separate seasons in 2020 and 2021. The study area was systematically gridded using a 1-km buffer, and only grids containing grassland habitats were selected for survey efforts. Within each grid, survey points were established with a minimum distance of 500 metres between them to avoid overlap. Rainy and other unfavourable weather conditions were avoided to ensure accurate observations, and accessible points with clear visibility of the surrounding environment were prioritized.

To assess Jerdon's Babbler populations, two main methods were used: point counts and call playback. These methods provided complementary insights into the species' presence, behaviour, and population density.

Fixed point count surveys

Fixed point count methods (Hutto *et al.* 1986) were employed to assess sympatric species and habitat interactions, despite the inherent challenge of reduced detection probabilities in grassland habitats. A total of 746 survey sites were examined across the Brahmaputra floodplains, encompassing the historical range of the species. Surveys were conducted during early morning and evening hours to maximize bird activity and detection likelihood.

Observations were made within a 25-metre radius over a 10-minute period using binoculars. Data collected included the species observed, distance, perch height, and the number of individuals. Adverse weather conditions were strictly avoided to minimize observation biases.

Call listening and playback

The call playback method, widely recognized for its effectiveness in surveying elusive and vocally responsive bird species (Conway & Gibbs 2005), was used to specifically target Jerdon's Babbler. Call playback was integrated into all fixed point count locations to maximize detection rates. Initially, vocalizations were recorded during preliminary field observations and then played back at predetermined survey points within the species' habitat. Playback sessions were conducted during optimal times, considering diurnal and seasonal variations.

Each session involved a structured protocol: a 2-minute listening period followed by 2-minute playback and one repetition as needed to enhance detection chances. Observers recorded vocal responses, territorial behaviours, and other activity cues. Call directions and frequencies were analysed to estimate the number of individuals.

Secondary data collection

Extensive literature reviews were undertaken to gather historical distribution data for Jerdon's Babbler, enabling comparisons between past and present occurrences. Spatial data were collected to evaluate habitat shifts over time, with a focus on identifying trends and potential

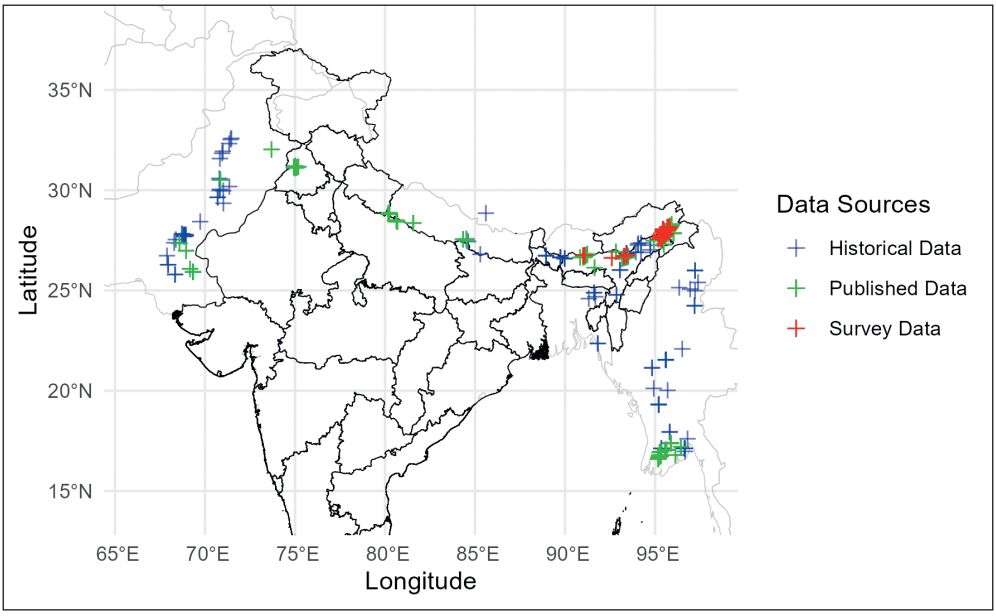

Figure 1. Occurrence map of Jerdon's Babbler based on multiple data sources
1. ábra A Jerdon-timália elterjedési térképe különböző adatforrások alapján

habitat changes. Search keywords included "Jerdon's Babbler", "Sind Babbler", "Hume's Babbler", "*Chrysomma altirostre*", "*Pyctorhis altirostris*", and "*Moupinia altirostris*".

Additionally, eBird records (eBird Basic Dataset 2024) for Jerdon's Babbler, including its three subspecies, were sourced from the December 2023 dataset. Both vetted and unvetted records were merged to create a comprehensive dataset, with entries lacking coordinates or containing spatial errors exceeding 10 km excluded. Historical data (pre-1980s) and recent occurrences (post-2000) were georeferenced *(Figure 1)*, while records between these periods were omitted to focus on distinct temporal comparisons.

Habitat shifts and kernel density estimation

To examine habitat shifts over time, historical and current occurrence points were analysed using kernel density estimation (KDE) (Kim & Scott 2012). KDE was employed to generate heatmaps that identified areas with high concentrations of Jerdon's Babbler occurrences. This technique helped visualize shifts in population density and habitat preferences between historical and current periods.

Kernel bandwidths were determined based on the spatial spread of the occurrence data, ensuring an appropriate balance between smoothing and detail preservation. KDE analysis highlighted regions of habitat contraction, expansion, and shifting centroids, providing critical insights into changes in the species' spatial distribution.

Centroid calculations and shift measurements

Centroid calculations were used to capture the central tendency of species distribution within each subspecies zone. Historical and current distributions were grouped by subspecies, and centroids were computed using the st_centroid function in R. Habitat shifts were quantified by measuring the distance between historical and current centroids with the st_distance function. Directional movements were visualized with arrows pointing from historical to current centroids, clearly illustrating spatial shifts.

The analysis employed R version 4.4.2 (R Core Team 2024) with packages such as **sf** for spatial data processing, **ggplot2** for visualization, and **raster** for geospatial data handling. Kernel Density Estimation (KDE) and centroid analyses offered insights into habitat shifts, with trends visually examined for conservation implications. Additionally, a 50 km buffer was applied to expand coverage, and polygon areas were calculated using st_area and converted to square kilometres to quantify spatial changes.

Results

Current distribution

Observations confirmed the presence of the species in 129 sites, reflecting its restricted and fragmented current distribution compared to historical records. A literature review yielded

119 historical locations, but after rigorous vetting, 106 GPS locations were deemed reliable and selected for analysis.

Indian zone

Historically, Jerdon's Babbler was predominantly found in the Terai-Duar grasslands and Brahmaputra Valley grasslands. Its distribution in the past was more uniform and widespread, indicative of stable habitat conditions and relatively unfragmented ecosystems. Notably, no historical records were reported from Arunachal Pradesh, suggesting either limited distribution in this region or under-surveyed areas.

The current distribution shows a significant eastward shift in the centroid, approximately 361 km from its historical centroid location *(Figure 2)*, now concentrated in the upper Brahmaputra Valley and parts of Arunachal Pradesh. This shift likely reflects habitat loss and fragmentation in its historical range, driving populations into more isolated and potentially less disturbed regions. Current population densities are highest in smaller, fragmented

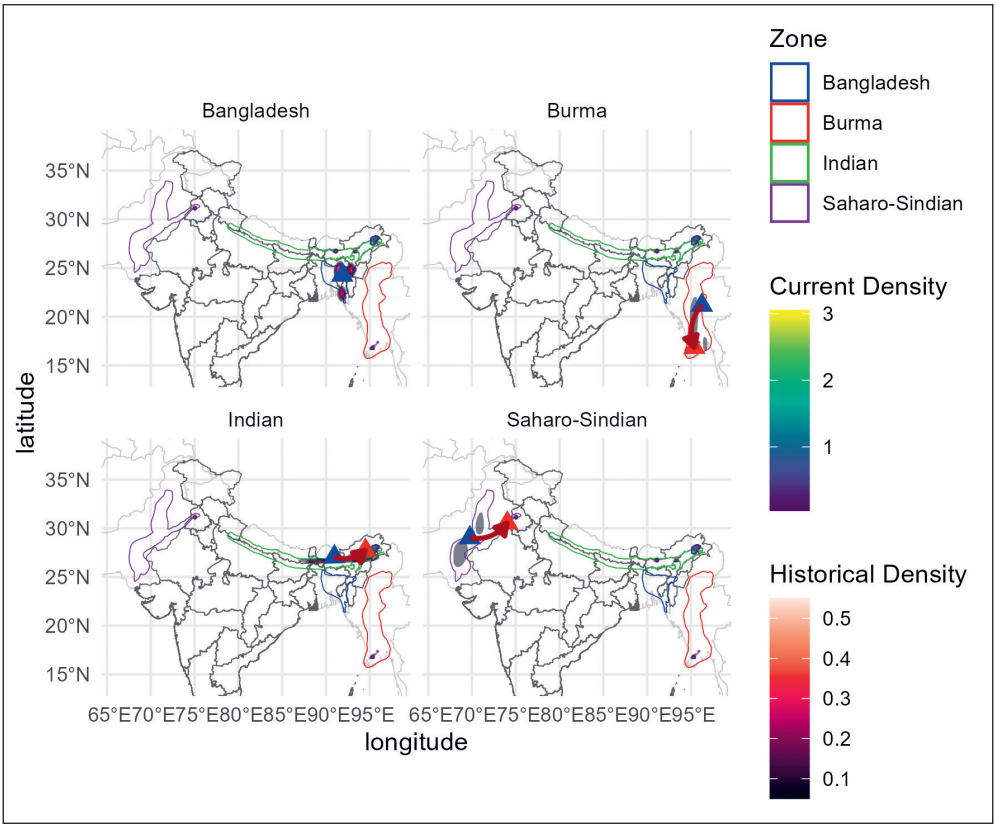

Figure 2. Map depicting range shifts of Jerdon's Babbler across subspecies zones, highlighting historic (blue triangles) and current (red triangles) centroids

2. ábra A Jerdon-timália elterjedési területének eltolódása az alfajok zónái között, kiemelve a történelmi (kék háromszögek) és a jelenlegi (piros háromszögek) középpontokat

patches, contrasting with the broader and more contiguous historical ranges. Protected areas like Kaziranga National Park and Manas National Park support relatively stable populations, particularly in the grasslands dominated by kans grass.

Burmese zone

In Myanmar, Jerdon's Babbler historically exhibited a broader and more contiguous range across riverine grasslands, supported by stable ecosystems with well-distributed density gradients. These conditions suggest that the habitats were once robust and less influenced by habitat loss.

Presently, the centroid of Jerdon's Babbler distribution in the Burmese Zone has shifted approximately 490 km southwestward *(Figure 2)*. The high-density populations are now restricted to grassland patches in areas such as Shwelaung, particularly near water bodies and marshlands. This shift indicates a reduction in habitat connectivity, likely driven by agricultural expansion, urbanization, and changes in hydrology. Fragmentation within these regions poses significant challenges to the long-term viability of the species in Myanmar.

Saharo-Sindian zone

Historically, the Saharo-Sindian zone encompassed the floodplains of the Indus River and adjacent desert-edge grasslands, characterized by reed-dominated habitats. The distribution in this zone was relatively extensive, suggesting suitable ecological conditions in the past.

Currently, the centroid of the species' range in this zone has shifted approximately 444 km northwestward *(Figure 2)*, now centroid is near Jalandhar in Northern India. Interestingly, historical records do not include observations from this specific region, suggesting either recent expansion or improved detection due to focused survey efforts. However, the density in this zone is notably low, reflecting extensive habitat degradation and loss, particularly in its historical range. Though the recent sightings from this region highlight the need for further investigation to understand the species population status.

Indo-Bangladesh zone

The Indo-Bangladesh zone historically supported populations of Jerdon's Babbler, with records indicating significant presence in areas such as Sylhet and the Surma Valley. However, no recent sightings of the species have been reported from this region, suggesting local extirpation. The loss of populations in this zone may be attributed to widespread habitat conversion for agriculture, urbanization, and wetland degradation, which have drastically altered the landscape.

Observations from Northeast India

Extensive surveys in northeastern India revealed that the populations of Jerdon's Babbler are now majorly confined to protected areas and less accessible regions, such as the islands

of the Brahmaputra River. These areas serve as refuges, providing relatively undisturbed habitats crucial for the species' persistence. Arunachal Pradesh, Kaziranga National Park, and Manas National Park emerged as key strongholds, with populations thriving in grasslands dominated by kans grass. Despite these pockets of stability, the overall range remains fragmented, with limited connectivity between populations.

Distribution patterns

The analysis of historical and current occurrence data revealed distinct patterns of distribution across the subspecies zones of the species. Kernel density estimation highlighted areas of concentrated occurrences, identifying high-density zones across the species' range. These findings underscore the stark differences between historical and current distributions, marked by areas of overlap and divergence.

The analysis revealed a significant reduction in the species' distribution. The historical distribution spanned 326,263 km^2, while the current distribution covered only 173,071 km^2,

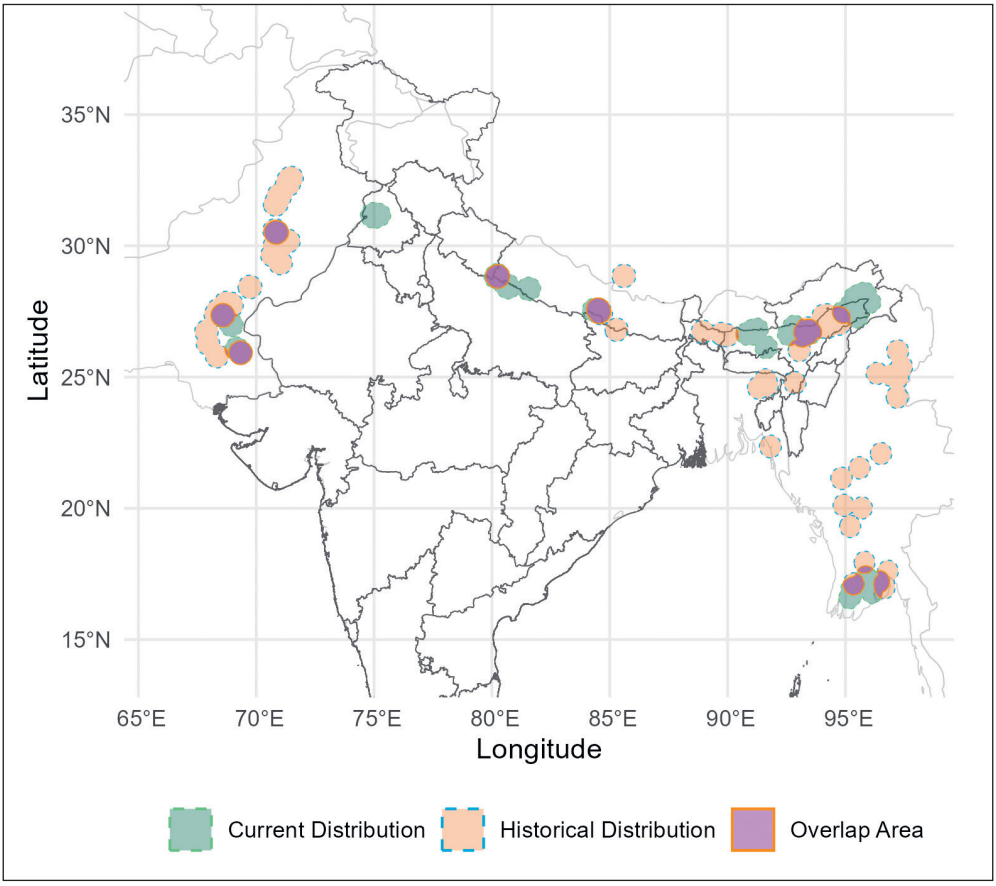

Figure 3. Map showing the historical distribution, current distribution, and overlap area of the species
3. ábra A faj egykori és jelenlegi elterjedése, valamint a kettő közötti átfedési terület térképe

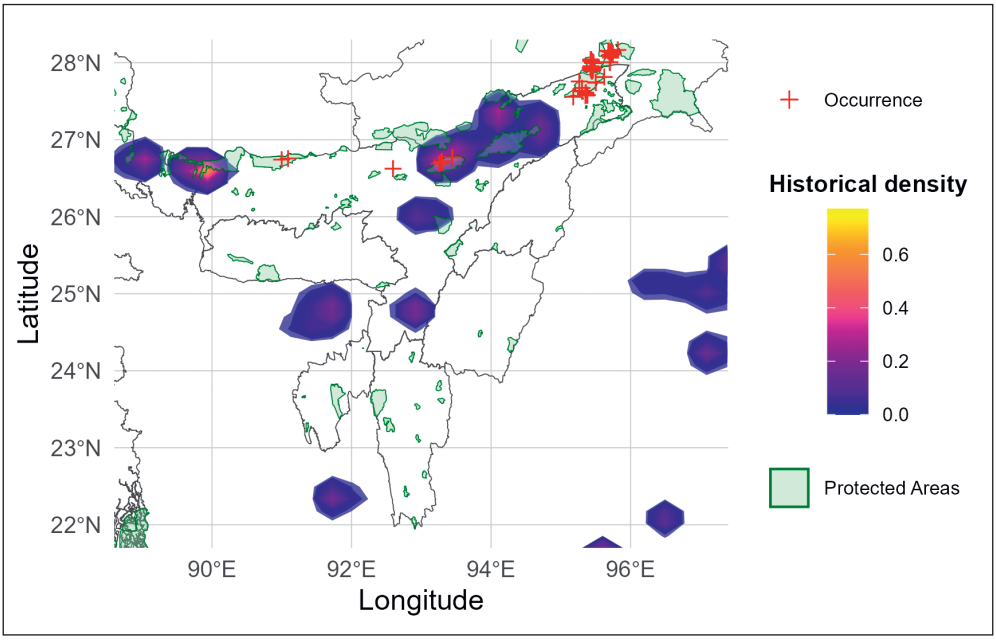

Figure 4. Map of the intensive study area depicting the current distribution of Jerdon's Babbler, historical records, and protected areas

4. ábra Az intenzíven vizsgált terület térképe, amely a Jerdon-timália jelenlegi elterjedését, a történelmi adatokat és a védett területeket ábrázolja

reflecting a loss of 254,639 km^2. Overlap between historical and current areas was limited to 71,623 km^2, indicating zones of persistence *(Figure 3)*. However, 101,448 km^2 of new areas were identified as potential habitat gain, suggesting possible range expansion.

While historical data depict a more uniform and contiguous range, current patterns indicate severe fragmentation and habitat contraction. The kernel density heatmap clearly illustrates these changes, with high-density populations now confined to isolated patches within each subspecies' range *(Figure 4)*. These shifts reflect the combined effects of habitat degradation, anthropogenic pressures, and environmental changes, emphasizing the urgent need for targeted conservation measures to preserve the remaining populations and restore degraded habitats.

Discussion

Habitat challenges and conservation needs

This study underscores the critical challenges facing Jerdon's Babbler, including habitat degradation, population decline, and increased dependence on disturbed environments. Habitat loss, largely driven by agricultural expansion, infrastructure development, and climate change, has reduced the availability of suitable grassland habitats. Fires during

breeding seasons (June–July) exacerbate this problem, disrupting reproductive success and long-term viability (Murphy *et al.* 2010, Long *et al.* 2023, Peltzer *et al.* 2023). Additionally, unauthorized use of playback calls in ecotourism areas further interferes with the species' natural behaviours, such as mating calls and territorial displays, particularly in grassland patches along the Brahmaputra River.

Environmental changes such as proposed dam constructions, mining activities, and the degradation of grassland ecosystems present significant threats not only to Jerdon's Babbler but also to the broader biodiversity of riverine systems like the Brahmaputra. These ecosystems are vital for many grassland-dependent species, underscoring the urgency for targeted habitat restoration and protective measures.

Although the species demonstrates some adaptability by transitioning to novel environments, the long-term suitability of these alternative habitats remains uncertain. Conservation measures must prioritize the restoration of traditional grassland ecosystems, minimize disturbances during critical periods, and address broader ecological challenges such as climate change and unsustainable tourism practices.

Status and distribution

Our findings reveal a significant contraction in the distribution range of Jerdon's Babbler compared to historical records, particularly in key habitats like the floodplains of Assam and Myanmar. This aligns with trends observed in other passerine species facing similar anthropogenic pressures (Rushing *et al.* 2020). However, the identification of new populations in previously undocumented regions suggests that the species might exhibit ecological plasticity, albeit inconsistently across its range. The absence of recent observations in historically dense areas highlights the need for further, comprehensive surveys to accurately define the species' current distribution.

Habitat shifts

The findings underscore extensive habitat loss, with the current distribution comprising only 52% of the historical extent. The overlap region represents critical zones for species survival and conservation prioritization. While the 50 km buffer and simplified geometries facilitate analysis, they may overgeneralize dispersal or omit fine-scale habitat details. The species increasingly observed in fragmented or degraded grasslands characterized by proximity to protected areas (Pacifici *et al.* 2020) and high-quality grasslands. These shifts are likely driven by habitat degradation, climate change, and agricultural encroachment, which have rendered traditional habitats less suitable.

This trend mirrors patterns observed in other avian species that exploit disturbed environments as a survival strategy (Newcombe *et al.* 2023). While this adaptability indicates ecological resilience, it raises concerns about long-term population viability if such habitats fail to provide adequate resources for reproduction and survival.

Effectiveness of conservation measures

Protected areas such as Kaziranga and Manas National Parks have proven effective in preserving populations of the species, offering relatively undisturbed environments dominated by kans, vetiver, and tall reed grasslands. High population densities within these zones highlight the importance of habitat management and protection. Regular monitoring programs within these areas provide a framework for assessing population trends.

However, challenges persist even within protected zones. Seasonal flooding, uncontrolled fire, invasive plant species, and insufficient enforcement against unauthorized activities degrade habitat quality and disrupt the species behaviour. Furthermore, many critical grassland patches, particularly in Arunachal Pradesh, lie outside protected areas, leaving these populations vulnerable to unregulated human activities.

This study acknowledges several limitations that could impact the robustness of its findings. One significant issue is the reliance on secondary data, as historical distribution records often lack consistency due to taxonomic revisions, vague descriptions about location, and the absence of standardized reporting methods. Another limitation lies in survey coverage, as field surveys were confined to northeastern portion of India.

To address these limitations, future research should adopt several measures to improve data quality and comprehensiveness. Longitudinal studies are crucial for monitoring dynamic changes in habitat and population trends across multiple seasons. Advanced technologies, such as remote sensing for habitat mapping and bioacoustic (Hobi *et al.* 2021) methods for accurate species detection, can enhance data precision (Toenies & Rich 2021). Engaging local communities in data collection and conservation initiatives, particularly in under-surveyed regions, can improve coverage and integrate valuable traditional knowledge. Lastly, genetic studies should be conducted to evaluate population connectivity, clarify subspecies classifications, and identify potential bottlenecks caused by habitat fragmentation.

Implications for conservation

The observed distribution shifts and habitat contractions underline the urgency of targeted conservation measures. Efforts must prioritize restoring and protecting traditional grassland habitats while exploring the viability of newly adopted habitats as supplementary refuges. Enhancing landscape connectivity through habitat corridors could sustain genetic diversity and mitigate local extinctions.

Conclusion

This study highlights the ecological and conservation challenges confronting Jerdon's Babbler, emphasizing both its resilience and its vulnerability. While the species demonstrates adaptability, the contraction of its traditional range and increasing reliance on fragmented habitats raise concerns about its long-term viability. Our findings reveal significant habitat contraction, with the current distribution encompassing only 52% of its historical range.

Effective conservation efforts must prioritize the restoration of these habitats, coupled with landscape-scale strategies to mitigate fragmentation and enhance connectivity.

Key conservation measures should prioritize the restoration of traditional grassland ecosystems, enhance connectivity through habitat corridors, and mitigate disturbances, especially in unprotected areas. Protected zones like Kaziranga and Manas National Parks remain crucial refuges, but conservation efforts must extend beyond these areas to address regional threats and ensure species persistence.

This study underscores the urgency of targeted conservation actions to protect Jerdon's Babbler and its threatened grassland habitats. While facing significant threats, the species' resilience offers hope, provided informed actions, continued monitoring, and research are prioritized to secure its future amidst ongoing environmental changes.

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